ATTACHMENT 1

NUCLEAR MATERIALS FOCUS AREA

TECHNOLOGY PROPOSAL EVALUATION AND RANKING CRITERIA

The nine criteria below will be applied to assess and rank project proposals. An additional measure, called "step change" will also be applied. Step change is achieved as a result of two-to-one or greater improvement in cost, risk, or schedule or when a technology or system fills a gap where no viable baseline technology exists. Proposals must contain sufficient information for reviewers to apply the criteria and to determine whether the successful completion of the project will result in a step change. Point weighting is not shown here, but approximately 60% of the possible total points will be from the first four criteria.

Section 1: Applicability to EM Paths to Closure, DNFSB and Safety/Security Requirements (subcriteria listed in descending priority)

Criterion #1: Prevalence in DOE Complex

1. Technology can solve unique EM nuclear materials problems at multiple DOE sites and no baseline technology exists.
2. Technology can solve similar EM nuclear materials problems at multiple DOE sites.
3. Technology can solve EM nuclear problems similar to other (non-EM) work, but is justified by its highly specific nature.

Criterion #2: End User Commitment

1. The technology is leveraged by significant funding from end-users.
2. The end-users have provided written support for the technology.
3. The end-users verbally support the technology.

Criterion #3: Cost Reduction

1. There is potential for >50% cost avoidance or savings over baseline or an enabling technology can be provided where a signficant need exists.
2. There is potential for a cost avoidance of 25-50% over baseline.
3. There is potential for cost avoidance up to 25% over baseline.

Criterion #4: Safety Risk Reduction

1. The technology will significantly reduce one or more safety risk categories.
2. The technology will moderately reduce one or more safety risk categories.
3. The technology will result in no significant reduction in any safety risk category.

Criterion #5: Meets EM Regulatory, DNFSB and Safety/Security Requirements

1. Meets end-user needs without invoking significant new regulatory, safety, or security requirements.
2. Meets end-user needs but invokes some new regulatory, safety, or security requirements.
3. Meets some end-user needs but invokes significant new regulatory, safety, or security requirements.

Section 2: Performance-based Criteria

Criterion #6: Technical Viability

1. Expert technical review assesses high probability of success.
2. Probability of success is medium.
3. The probability of success is low.

Criterion #7: Engineering/Constructability

1. Engineering and construction approach uses standard industry practice.
2. Some engineering development is required.
3. Significant engineering development is required.

Criterion #8: Project Management Performance

1. Milestones for project performance metrics, technical/program reviews, and meaningful measures of project progress are provided. A life-cycle cost estimate is included that identifies all project cost and the basis for the estimate. Projected cost savings of technology against the current baseline are included.
2. The proposal identifies some project performance metrics and technical/program reviews. A life cycle cost estimate identifies out-year cost. Projected cost savings of using technology are included.
3. The proposal identifies some milestones and a general spending plan.

Criterion #9: Stakeholder Acceptance

1. The technology will be highly acceptable to regulators and stakeholders.
2. Regulator and stakeholder acceptance will be moderate.
3. Technology acceptance to regulators and stakeholders questionable or unlikely.

ATTACHMENT 2

Scope of Work for FY2001 NMFA Call for Proposals

Work Package NM02-STB-01: Stabilization - Nuclear Material Stabilization.

(Available FY2001 funding approximately $3.9M)

The stabilization product line mitigates high-risk EM safety and security issues by addressing technology needs through October 2002. Resolution of these issues is necessary to meet site closure schedules, DNFSB commitments and regulatory requirements to stabilize nuclear material residues, solutions and classified shapes at RFETS, RL, SRS, Mound, Fernald, LANL and LLNL. At most closure sites, nuclear materials stabilization is a critical path element of site closure, as stabilization is required before materials can be packaged and shipped offsite and facilities decommissioned.

Stabilization technologies also are needed for decontamination of plutonium and uranium parts, processing of "off-spec" highly enriched uranium and stabilization of U233. These needs will be addressed by deploying technologies from March 2002 through September 2008.

Product Line Manager:
P. Gary Eller (acting)
Los Alamos National Laboratory
505-667-7111
p_gary_eller@lanl.gov

Work Area: Moisture Measurement

Problem:

The potential for storage container pressurization and/or corrosion in storage containers is subject primarily a function of the quantity of water in the stored material. To ensure that over pressurization or corrosion does not occur, the water content of the stabilized material must be measured and shown to be below specified limits. Moisture measurement by traditional methods such as Loss-On-Ignition (LOI) is not accurate for impure plutonium bearing materials. Satisfactory methods must be developed to measure the moisture content of impure plutonium or uranium bearing materials to ensure that the materials stored are as dry as possible and that the moisture content is within the established limits. This work package proposes a program of experiments to develop enhanced or alternate moisture measurement methods.

Work Description:

This project has one major element – development of one or more moisture measurement methods. Numerous methods have been proposed to the community. These techniques must be evaluated and specific measurement methods identified as potentially applicable to meet each of the site needs. The instrument or instruments must then be designed,

built, and tested. These instruments must return accurate and real-time results to support stabilization and packaging efforts at the different sites.

Product(s) Once the technique or techniques are proven, they will be built and deployed at sites around the complex that are stabilizing plutonium and/or uranium bearing materials.

Needs Addressed:

Need number	*Need title*
AL-09-01-38-NM	Moisture Analytical Methods for Nuclear Materials
RF-SNM14	Moisture Analytical Methods for Plutonium Materials
RL-00-005-NM	Moisture Measurement on Stabilized Material for 3013 Container Storage
SR00-5025	Moisture Analysis Methods for Impure Plutonium Materials

Work Area: Removal of Pu Contamination

Problem: During dismantlement of weapons, Pu parts are separated from U parts leaving some residual Pu contamination on the U. The Pu must be removed to a level of <20 dpm Pu/100 cm^2 to meet acceptance criteria for shipment to the Y-12 plant at Oak Ridge for recycle or disposal. Alternative methods for the removal of the Pu contamination need to be developed. LLNL has approximately 200 plutonium contaminated parts (~75 kg uranium) containing >5 ppm plutonium that must be decontaminated to meet Y-12 acceptance criteria. Savannah River has additional materials requiring decontamination. Techniques deployed may also ultimately be used to decontaminate materials that are not Special Nuclear Materials.

Work Description: Define develop and deploy systems capable of decontaminating Pu-contaminated parts, including classified shapes. Ensure that the selected option or options address needs as broadly as possible within the DOE complex. Technology alternatives may include either mechanical or chemical methods for removal of contamination.

Funding in this area would allow for modifications to a decontamination glove box system for acceptance of plutonium, followed by the demonstration and decontamination of plutonium contaminated uranium techology. The uranium parts would then be packaged for shipment to Oak Ridge Y-12 for reuse.

Requirements for such a technological solution include:

1. System must be available within 4 years
2. System must work inside a glovebox, and may need to be portable
3. System must be capable of removing plutonium contamination from hemi-shells and other complex shapes
4. Decontaminated product must meet Oak Ridge Y-12 Plant acceptance criteria for recycling in reactor fuel or SRS requirements for longer term storage and processing

5. System should minimize cost
6. System should minimize generation of secondary waste streams, especially those with difficult disposition paths
7. System should minimize radiation doses and other hazards to workers
8. System must be criticality-safe
9. System should have been demonstrated to be compatible with end-user (LLNL facilities) and be ready for deployment.

The task will fund completion of a deployment, with the expectation that leveraged funding and/or support for site modifications and permitting will be supplied by the deployment site.

Needs Addressed:

Need number	*Need title*
OAK-99-002-NM	Decontamination of >5ppm plutonium contaminated Uranium and non-SNM materials allowing utilization of paths other than Material Disposition
SR00-5022	Identify and develop a better process to remove residual Pu From U metal

Work Area: Conversion of Classified Shapes

Problem: Improved physical and chemical processes are needed to convert classified shapes under EM custody to unclassified forms for disposition. Disposition of excess nuclear material under EM custody at Los Alamos, Savannah River, Rocky Flats and Livermore is hindered by classified aspects of their shapes. This problem greatly exacerbates transportation and storage prior to ultimate disposition. Inability to move material from RFETS would prevent site closure by 2006 as scheduled. Delayed disposition of excess classified LANL, Savannah River and Livermore material would seriously impact other missions due to site storage limitations.

Work Description: Improved processes are needed to convert classified shapes to nonclassified forms. This task will survey site needs for demilitarization of classified nuclear and non-nuclear parts generated by pit disassembly and manufacturing, as well as materials in storage. It will also review baseline and alternative options for disposition of these materials. Proposed systems may be either fixed of mobile and include processes for sanitization such as melting of classified parts of various kinds. The task will select and support development and deployment of such a system for disposing of these materials stored at various sites. Deployment at Rocky Flats is considered a high priority.

Needs Addressed:

Need number	*Need title*
AL-09-01-41-NM	Conversion of Classified Shapes

Work Area: Aqueous and Non-aqueous Processing

Problem: RFETS, SRS, and LANL have nuclear material residues and actinide products that require stabilization to meet DNFSB 94-1/2000-1 requirements. Some nuclear materials contain corrosive and volatile impurities. The bulk of these materials can be safely stored or disposed after stabilization; however, some of these materials will require further processing prior to any long term storage or disposal. Aqueous processing at SRS is needed for some RFETS materials and is a critical path activity for both site closure and to satisfy DNFSB 94-1/2000-1 milestones. Similar needs exist at Richland, SRS, and LANL to meet DNFSB 94-1/2000-1 requirements.

Work Description: This work package addresses improvements to existing processes for separation of metal, salt, and oxide residues, as well as processing of existing nuclear materials solutions. It also includes extension of these processes to handle additional materials. The need for improvements to processes exists at three sites – the Plutonium Facility at Technical Area (TA)-55 at Los Alamos National Laboratory (LANL), the Plutonium Finishing Plant (PFP) at Hanford, and the Savannah River canyons processing facilities. These needs are listed in Table 1.

The work package also addresses technology development and deployment for a variety of nuclear materials that are less common and generally site specific. They range from low-content residues to unusual fuel types to neutron sources. The needs come from three different sites, and are connected to additional expected needs at other sites. The work package is subdivided into four tasks addressing single or multiple needs. Some technology may also be applicable to needs for Spent Nuclear Fuel (SNF) that will be addressed in FY 2002.

Needs Addressed:

Need number	*Need title*
AL-09-01-39-NM	Nuclear Materials Stabilization Development
OAK-99-003-NM	Concentrating Plutonium in 20-30 wt.% Plutonium Residues to Allow Disposition by the Fissile Material Disposition Program
RF-SNM13	RFETS Residue and Misc. TRU Waste Stabilization Process Support
RL-00-008-NM	Coverage of Miscellaneous Small Categories of Materials Without a Defined Disposition Path

Need number	*Need title*
RL-00-007-NM	MIS Coverage of Materials with <30% Pu but > Safeguards Termination Limit or Path Forward
RL-99-004-NM	Extension of Plutonium Precipitation Process for Hanford's Plutonium Finishing Plant
RL-MW014	Technology to Dispose of 12 Drums of ^{238}Pu (500g/drum)
SR00-5023	Aqueous Processing of Chloride-Bearing Plutonium Residues in Existing Facilities
SR00-5020	Dissolution of Plutonium Metal with Minimal Hydrogen Generation
SR00-5019	Prevention of Precipitation of Unwanted Solids during Canyon Dissolution
SR00-5021	Removal of Fluoride Ion from Acid Solutions for Recycle And Reduction of Waste Volume

Work Package NM02-PNT-01: Technology Issues in Packaging and Storage

(Available FY2001 funding approximately $2.5M)

Critical path activities for site closure and DNFSB 94-1/2000-1 milestones at RFETS are being jeopardized by the shutdown of the large-scale shipment of Pu materials in the complex. At sites such as Mound, lack of testing facilities is making it impossible to ship materials. At the Fernald site, the closure critical path is being jeopardized by reduced productivity in uranium repackaging operations due to heightened concerns over worker exposure to Pu in this material. One part of this work package proposes an integrated program of experiments, modeling, and improved instrumentation to resolve the gas generation issue for nuclear materials. The changing nature of the DOE nuclear materials mission has stressed our capability to package, store, and transport nuclear materials. Other nuclear materials in various stages of the processing cycle, and not historically packaged for long term storage or transport require addressing. Continued progress at many closure sites now depends on our ability to safely package, transport, and store these materials.

Product Line Manager:
Gary Polansky (acting)
Sandia National Laboratory
505-845-7029
gfpolan@sandia.gov

Work Area: Gas Generation in Transportation and Storage

Problem: The potential for radiolytic gas generation to pressurize transportation and storage containers with high-pressure mixtures of potentially explosives gases is a major issue affecting the EM program's ability to transport and store nuclear materials. The ability to predict such gas generation across a wide range of material characteristics is limited and great conservatism is required in transportation and storage activities. At present, extensive testing programs are required to verify the gas generation characteristics of each type of material proposed for transportation or storage. Such testing is expensive and time consuming and frequently delays site schedules. At present, large scale shipment of Pu materials is shut down by concerns over gas generation.

Work Description: The FY01 focus of this work package is on improved modeling of gas generation. This effort should focus on the development of validated modeling tools that can be used to predict gas generation across a range of nuclear material for transportation and storage environments. The modeling activity will develop the ability to predict both pressure generation and gas composition and consider effects such as solid/gas heterogeneous reactions, radiolysis pathways, and the thermochemical properties of steady state products. The initial effort will focus on pure PuO2-H2_O2 systems, be validated with the experimental data, and then proceed to considering other constituents representative of the various grouping of materials in the DOE complex. The

modeling activity should utilize the best available experimental data for validation, and if necessary, include additional benchmark experiments. This effort is expected to produce a final report of sufficient quality that it can serve as a basis for requests to the regulator to ship materials of interest based on predicted gas generation characteristics.

Needs Addressed:

Need number	*Need title*
SR00-5018	Gas Generation during Shipping and Storage of Residue Materials
AL-09-01-27-NM	Gas Generation Measurements for Nuclear Material Shipping
RF-SNM17	Gas Generation Measurements for NM Shipping Environments
OAK-99-004-NM	Physical Process Modeling of Gas Generation in Plutonium Storage Containers
AL-09-01-36-NM	Nuclear Materials Deflagration Modeling
AL-00-01-17-NM-S	Modeling of Gas Generation during Storage and Shipping

Work Area: Automated Packaging of Nuclear Material

Problem: Fernald, like many other DOE sites, has large quantities of nuclear materials that must be repackaged before they can be shipped offsite for further processing or disposal. These materials exist in a variety of chemical and physical forms and normally require characterization, sorting, and in some cases size reduction, as a part of the repackaging operation. Historically, these operations have been performed manually in the DOE complex. In recent years, ALARA concerns have dramatically changed the procedures by which these repackaging operations are performed. These modified procedures have severely limited worker productivity and now jeopardize the ability of these sites to meet their closure schedules. Recent revelations concerning trace quantities of plutonium in uranium materials in the DOE complex threaten to further reduce worker productivity in these material-handling operations.

Work Description: The FY01 focus of this effort is to develop key technologies to support the deployment of an automated nuclear material processing system for the Fernald site. The operation of robotics and automation in a closed environment with hazardous materials poses a number of unique challenges. The key technologies necessary to support this deployment include: (1) path planning and collision avoidance, (2) sensor based control and path planning, (3) vision based control and path planning, (4) modular automation, and (5) suitable for re-deployment at other sites. The materials of interest for the FY01 activity are identified under PBS OHFN0239, Project OH-FN-08 Nuclear Materials. These materials must be removed from the site by the end of 2005. To achieve this goal, this technology must be deployed in FY02. The FY01 effort must demonstrate the key technologies to support the FY02 deployment.

Needs Addressed:

Need number	*Need title*
OH-F045	Investigate Processing and/or Transportation of “Problem Materials”
AL-09-01-46-NM	Development of Automated Systems that Support Plutonium and Other Nuclear Materials Processing and Handling

ATTACHMENT 3

NUCLEAR MATERIALS FOCUS AREA

SHORT FORM TECHNICAL TASK PLAN (STTP) PREPARATION GUIDELINES

It is strongly recommended that the STTP author consider the Technology Proposal Evaluation and Ranking Criteria (Attachment 1) when developing the STTP. It is anticipated that proposal narratives will be limited to 4 pages or less in font size 12, excluding budget and schedule information.

Proposals are to be prepared and submitted using STTP format. A STTP template is available at ftp://www-emtd.lanl.gov/ftp/NMFAshortform.doc.

Specific requirements for the STTP are described below.

Task/Subtask Summaries:

Provide a summary for each task (A, B, C, etc.) included in the STTP in the format shown below.

1. **Task Title -** Principal Investigators Name, FY01 Funding Level request, Joint funding (as appropriate)

2. Key Problem Area Addressed:

A. Brief overview of the needs to be satisfied by this task

B. Links to End-Users - Specify the STCG Needs being addressed and links to EM Paths to Closure (PTC) Project Baseline Summaries (PBSs). The proposal should specify the primary need being addressed at the target demonstration site and specify the other needs for which this STTP provides a viable solution. Similarly, the proposal should specify the PBS that covers the target deployment site for the technology and the PBS that covers any other sites for which this technology may constitute a viable solution. This information is available in Attachment 2 of this memo, from the IPABS system and at http://www-emtd.lanl.gov/NMFA/DOElinks.html.

End user commitment to the proposal should be identified as well as probable stakeholder acceptance.

C. Prior Accomplishments - Summarize any relevant accomplishments to date.

3. Technical Issues/Scope

Describe any issues surrounding or impeding the technical response to the problem.

A. FY01 Technical Scope - Describe the technical objectives, expected outcomes, and products of the FY2001 work as it addresses the problem and issues.

B. Outyear Activities – Include major activities for each funding year of the project to complete development. Define the project completion date, expected out year costs and total life cycle costs.

C. Impact - At each DOE site that may be affected by the technology, define the benefit in terms of EM safety and security vulnerability reduction, cost reduction and avoidance, remediation schedule compression and/or risk reduction. The technology's ability to meet regulator expectations also should be included.

D. Benefit - For each site affected, define the benefit of using the proposed technology (e.g. will enable site to reduce EM safety and security vulnerabilities, meet Closure Schedule and DNFSB milestones, reduce mortgage and technological risk, etc.). Estimate the cost/schedule savings from deployment of this technology. NMFA acknowledges that this estimate may have significant uncertain and requests best estimates including uncertainty (*e.g.*, +/-20Y or +/- $20M).

E. Milestone(s): Identify major accomplishments, deliverables, or decision points for each task and provide due dates. Number these sequentially (*i.e*. Al-01, Al-02; where A denotes the task, 1 denotes the work element, and 01, 02, etc. are the milestone sequence numbers). Minimum expected milestones are demonstrations, deployments, and readiness for implementation. Additional milestones should be identified as needed for important deliverables, interim status of major activities (e.g. Gate reviews, Peer reviews, etc.), actions necessary to support deployment (e.g. operational readiness reviews), etc. Milestones should be assigned to levels 1, 2 or 3. Levels one and two refer to high-level project milestones that must receive HQ or NMFA approval if changed. HQ-level milestones are considered Level 1 and NMFA expects transmittal of deliverables for this level of milestone. Level 2 milestones are Focus Area controlled and must have NMFA Lead Office approval to be changed. Level 3 milestones are contractor milestones.

4. Budget Summary

A. Life Cycle Costs: Provide a budget summary that is a roll-up of costs for each task. Current year estimates must be supported by activity-based estimates for each task. Out year estimates should represent the entire life of the task through closeout. TTP numbers and any prior year cost for the proposed technology should be included, as well as the funding organization. Proposals without life-cycle cost estimates (up to the point that the technology is ready for implementation) will not be considered. NMFA acknowledges that such cost estimates may include considerable uncertainty, but NMFA is required to demonstrate end-point goals for each project, a reasonable schedule to achieve the project goals, and the ability to meet the end-users schedule requirements at a reasonable cost. Best estimates of uncertainty should be bracketed with an uncertainty range (*e.g*., +/- 20%)

Project funding sources external to NMFA also should be identified. This includes money or in kind services to be provided by private industry, other Federal Agencies or DOE Operations Offices.

B. Additional Costs: Adequate direct costs (including travel) should be anticipated for the following technical review activities:

- Independent Peer Reviews
- User reviews
- Cost savings and Return on Investment analyses (e.g. camera ready Innovative Technology Summary Reports must be prepared in the project's final development stage)
- Midyear Technical Reviews
- Development of follow-on long form Technical Task Plans (LTTPs)

C. Spending Plan: The spending plan is a time-phased budget for the entire project and is a roll-up of the spending plans for each task within the STTP. PIs develop the spending plans for the individual tasks based on scope and schedule for performing the work.

ATTACHMENT 4

Schedule of Activities to Support NMFA FY2001 R/D

Activity	Completion Date
Call for proposals sent to TPOs	6/09/00
Proposals received from TPOs	6/23/00
NMFA proposal evaluation completed	6/30/00
Draft PEG completed	6/30/00
Draft PEG to end user steering group for review	6/30/00
End user PEG review completed	7/7/00
Draft PEG transmitted to HQ	7/10/00
Draft PEG videoconference	7/18-20/00
PEG Presentation to HQ	7/25-26/00
Final PEG issued	7/28/00
TPOs notified of FY2001 projects to be funded	8/1/00
Long form TTPs due from TPOs	9/1/00

Proposal developers may contact Jeremy Boak of the NMFA Lead Laboratory at 505-667-0835 or jmboak@lanl.gov with any questions during the development of their proposal.